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Proceedings of the PSARC Pelagic Subcommittee Meeting November 19-20, 2002

J. King
Pelagic Subcommittee Chair

Fisheries and Oceans Canada
Pacific Scientific Advice Review Committee
Pacific Biological Station
Nanaimo, British Columbia V9T 6N7

December 2002

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PACIFIC SCIENTIFIC ADVICE REVIEW COMMITTEE (PSARC)
PELAGIC SUBCOMMITTEE MEETING

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SUMMARY

The Pacific Scientific Advice Review Committee (PSARC) Pelagic Subcommittee met November 19-20, 2002 at the Pacific Biological Station, Nanaimo, British Columbia to review scientific information relating to British Columbia pelagic fish biology, distribution and assessment.

Working Paper P2002-08: Fraser River eulachon biomass assessments and spawning distribution: 1995-2002.

This paper presents Fraser River eulachon egg and larval surveys (1995-2002) to estimate spawning stock biomass and spawning distribution. Measures of larval density are used to estimate total larval numbers and are combined with measured estimates of relative fecundity to estimate spawning stock biomass. Comparing the estimated spawning biomass among different areas of the river allows for estimation of general spawning locations each year. The Subcommittee accepted the spawning stock biomass estimates outlined in the paper and noted the estimates should be considered conservative and are not intended to provide forecasts of recruitment. The Subcommittee noted that this estimate of spawning stock biomass can be used as one reference point and will be considered with other independent indicators to be outlined in an upcoming paper. The Subcommittee accepted this paper with revisions.

Working Paper P2002-09: A review of the biology and fishery of the embiotocids of British Columbia

This paper is a Phase 0 review of surf perch (embiotocids) biology, distribution and fishery data. No reliable quantitative information is available on the recreational or commercial catches in British Columbia though surf perches are harvested primarily by recreational anglers who are almost totally confined to wharves. The present commercial fishery in British Columbia is thought to be small, but expanding. Surf perches are live-bearing fishes with extremely low individual fecundities. As such, they are susceptible to overharvesting and localized depletions are possible. The Subcommittee recommended that the sensitivity of surf perch populations to overharvest be communicated to the recreational fishing community. Monitoring and enforcement of commercial fishery regulations and logbook requirements must be enhanced. Logbooks should be modified to specify the three major species authorized for harvest. A seasonal commercial closure should be implemented for the period May 1 to August 31 to protect spawning aggregations. The Subcommittee accepted this paper with revisions.

Working Paper P2002-10: Review of surf smelt (*Hypomesus pretiosus*) biology and fisheries, with suggested management options for British Columbia

This paper is a Phase 0 review of surf smelt biology, distribution and fishery data.

Surf smelt biology and fishery data in British Columbia are extremely limited. The unmonitored and growing recreational fishery in Areas 28 and 29 could pose conservation concerns but without abundance information or catch and effort data, it is not possible to determine if the current level of exploitation in the recreational fishery is sustainable. Given this lack of information, the Subcommittee expressed concern about the expanding recreational fishery in Areas 28 and 29 and agreed that limitation to its expansion was warranted. There is a commercial smelt fishery in Areas 28 and 29. Logbook compliance is low so catch and effort data are unreliable. The size of this fishery is uncertain but it could be as large as the recreational fishery. The Subcommittee concluded that the commercial fishery should not be continued as it is presently conducted, given that there is an extremely low level of compliance and that very little of the catch is sold commercially. It would be appropriate to conduct this fishery in a Phase 1 approach. The Subcommittee accepted this paper with revisions.

Working Paper P2002-11: A review of northern anchovy (*Engraulis mordax*) biology and fisheries, with suggested management options for British Columbia

This paper is a Phase 0 review of northern anchovy biology, distribution and fishery data. The Subcommittee felt that it is important to determine if northern anchovy in British Columbia waters are migrants from a larger population or genetically distinct. Management frameworks would be different for migratory anchovy than for resident populations. The Subcommittee concluded that while there is no immediate interest in establishing a directed northern anchovy fishery, any future commercial fishery for northern anchovy would need to be developed under a Phase 1 experimental fishery approach. This should include monitoring of bycatch of juvenile salmon and herring. The Subcommittee accepted this paper with revisions.

Working Paper P2002-12: Population structure of herring (*Clupea pallasi*) in British Columbia, with comparisons to southeast Alaska and California

This paper presents a genetic analysis of Pacific herring based on analyses of microsatellite variation at 13 loci. This paper expanded 2001 analyses to include additional samples from a number of smaller, peripheral populations and some additional samples from major spawning populations allowing analysis of inter-annual differences in genetic structure. The Subcommittee noted that the present analyses was supportive of the present stock assessment areas used for Pacific herring. There is, however, strong evidence of some small genetically distinct populations that occur mainly outside or at the edge of major assessment areas. The Subcommittee concluded that more years of samples are required to further understand temporal variability and consistency in such samples that show preliminary genetic distinctiveness. The Subcommittee accepted this paper with revisions.

SOMMAIRE

Le sous-comité des pélagiques du Comité d'examen des évaluations scientifiques du Pacifique (CEESP) s'est réuni les 19 et 20 novembre 2002 à la Station biologique du Pacifique, à Nanaimo, en Colombie-Britannique, pour passer en revue les renseignements scientifiques sur la biologie, la distribution et l'évaluation de poissons pélagiques des eaux de la province.

Document de travail P2002-08 : Évaluations de la biomasse et de la distribution de la fraye de l'eulakane dans le Fraser : 1995-2002

Sont présentés dans ce document les résultats des relevés des oeufs et des larves d'eulakane effectués dans le Fraser (1995-2002) en vue d'estimer la biomasse du stock reproducteur et la distribution de la fraie. Le nombre total de larves a été estimé d'après les mesures de leur densité, qui ont été combinées avec des estimations de la fécondité relative pour obtenir une estimation de la biomasse du stock reproducteur. Une comparaison de cette biomasse estimative entre diverses parties du fleuve a permis d'estimer l'emplacement général des frayères chaque année. Le sous-comité a accepté les estimations de la biomasse du stock reproducteur présentées dans le document en indiquant qu'elles devaient être considérées comme prudentes et n'étaient pas des prévisions du recrutement. Il a aussi remarqué que cette estimation de la biomasse du stock reproducteur peut servir de point de référence et sera considérée de concert avec d'autres indicateurs indépendants qui seront présentés dans un rapport futur. Le sous-comité a accepté le rapport sous réserve de révisions.

Document de travail P2002-09 : Examen de la biologie et de la pêche des Embiotocidés de la Colombie-Britannique

Ce rapport porte sur la phase 0 d'un examen des données sur la biologie, la distribution et la pêche des ditrèmes (Embiotocidés). Aucune donnée quantitative fiable sur les prises récréatives et commerciales de ditrèmes en Colombie-Britannique n'est disponible, bien que ces poissons soient surtout pêchés presque exclusivement des quais. On croit que la pêche commerciale faite à l'heure actuelle dans les eaux de la province est de faible ampleur, bien qu'elle est en voie de prendre de l'expansion. Les ditrèmes sont vivipares, mais extrêmement peu féconds, ce qui fait qu'ils sont très vulnérables à la surpêche. Il est donc possible que les stocks s'appauvrissent au niveau local. Le sous-comité a recommandé que l'on fasse part de la vulnérabilité des populations de ditrèmes à la surpêche à la collectivité des pêcheurs récréatifs. La surveillance de la pêche, l'application des règlements de pêche commerciale et le contrôle des journaux de bord doivent être améliorés. Ceux-ci devraient être modifiés de sorte à ce qu'il soit requis d'identifier les trois principales espèces pêchées et une période de fermeture saisonnière du 1er mai au 31 août devrait être établie afin de protéger les concentrations de géniteurs. Le sous-comité a accepté le rapport sous réserve de révisions.

Document de travail P2002-10 : Examen de la biologie et de la pêche de l'éperlan argenté (*Hypomesus pretiosus*) et options de gestion proposées pour la Colombie-Britannique

Ce rapport porte sur la phase 0 d'un examen des données sur la biologie, la distribution et la pêche de l'éperlan argenté. On dispose de très peu de données sur la biologie et la pêche cette espèce en Colombie-Britannique. La pêche récréative dans les zones 28 et 29, en expansion mais non contrôlée, pourrait poser des problèmes de conservation, mais du fait qu'aucune donnée n'est disponible sur l'abondance, les prises et l'effort, il est impossible de déterminer si le niveau actuel d'exploitation dans la pêche récréative est durable. À la lumière du manque d'information, le sous-comité s'est dit préoccupé par l'expansion de celle-ci dans les zones 28 et 29 et a conclu qu'il était justifié de la limiter. L'éperlan argenté est aussi l'objet d'une pêche commerciale dans ces zones, mais le niveau de tenue des journaux de bord est faible, ce qui fait que les données sur les prises et l'effort ne sont pas fiables. L'ampleur de cette pêche est incertaine, mais elle pourrait être aussi importante que la pêche récréative. Le sous-comité a conclu que la pêche commerciale ne devrait pas continuer à être pratiquée comme elle l'est à l'heure actuelle, étant donné que le degré d'observation des règlements est extrêmement faible et que peu des prises sont vendues sur le marché. Il serait indiqué de pratiquer cette pêche selon une approche de la phase 1. Le sous-comité a accepté le rapport sous réserve de révisions.

Document de travail P2002-11 : Examen de la biologie et de la pêche de l'anchois du Pacifique (*Engraulis mordax)* et options de gestion proposées pour la Colombie-Britannique

Ce rapport porte sur la phase 0 d'un examen des données sur la biologie, la distribution et la pêche de l'anchois du Pacifique. Le sous-comité considérait qu'il était important de déterminer si l'anchois du Pacifique retrouvé dans les eaux de la Colombie-Britannique était un migrateur issu d'une plus grande population ou s'il était distinct au plan génétique, car les mesures de gestion d'une population migratrice et d'une population résidente ne seraient pas les mêmes. Il a conclu que même si l'on a pas l'intention d'établir une pêche dirigée de l'anchois du Pacifique dans un avenir rapproché, toute pêche commerciale future de l'espèce devra être développée selon une approche de pêche expérimentale de phase 1, qui devrait inclure le contrôle des prises accessoires de saumon et de hareng juvéniles. Le sous-comité a accepté le rapport sous réserve de révisions.

Document de travail P2002-12 : Structure des populations de hareng du Pacifique (*Clupea pallasi*) en Colombie-Britannique et comparaison à des populations du sud-est de l'Alaska et de la Californie

Sont présentées dans ce rapport des analyses génétiques du hareng du Pacifique reposant sur des analyses de la variation des microsatellites à 13 loci. Les analyses

effectuées en 2001 ont été élargies par l'ajout d'échantillons d'un certain nombre de petites populations périphériques et de quelques échantillons issus d'importantes populations de géniteurs, ce qui a permis d'analyser les différences interannuelles dans la structure génétique. Le sous-comité a noté que les analyses présentées confirmaient les zones d'évaluation des stocks utilisées à l'heure actuelle pour le hareng du Pacifique. Il existe toutefois de fortes indications qu'il existe quelques petites populations génétiquement distinctes retrouvées principalement à l'extérieur ou à la périphérie des principales zones d'évaluation. Le sous-comité a conclu qu'il faudrait plusieurs autres années de données pour mieux comprendre la variabilité temporelle et la cohérence des échantillons, qui indiquent à première vue une spécificité génétique. Le sous-comité a accepté le rapport sous réserve de révisions.

INTRODUCTION

The PSARC Pelagic Subcommittee met November 19-20, 2002 at the Pacific Biological Station in Nanaimo, British Columbia. External participants from industry attended. The Subcommittee Chair, J. King, opened the meeting by welcoming the participants. During the introductory remarks the objectives of the meeting were reviewed, and the Subcommittee accepted the meeting agenda. The Chair presented recommendations and discussion items from the September 19, 2002 meeting of RMEC at which recommendations from the last Pelagic Subcommittee meeting were presented.

The Subcommittee reviewed five Working Papers. The Subcommittee reviewed revisions to Working Paper P2002-01 (Tanasichuk) that was accepted with revisions at the September 2002 Subcommittee meeting. In addition, an update on the 2002 sardine fishery was presented along with information on the United States sardine stock assessment and biomass forecast for 2003. Summaries of the Working Papers are in Appendix 1. The meeting agenda appears as Appendix 2. A list of meeting participants, observers and reviewers is included as Appendix 3

DETAILED COMMENTS FROM THE REVIEWS

P2002-08: Fraser River eulachon biomass assessments and spawning distribution: 1995-2002

D. Hay, P.B. McCarter, R. Joy, M. Thompson, K. West **Accepted subject to revisions**

Rapporteur: Diana Trager

This paper follows from a 1997 paper presented to PSARC on eulachon assessments. This paper presents an index of spawning stock biomass developed from Fraser River eulachon egg and larval surveys, and the Subcommittee noted that the index has no predictive capability. The 2002 paper is a prerequisite to a second paper on reference points for management of Fraser River eulachon to be presented

at a February, 2003 Subcommittee meeting. This later paper will consider data from test fisheries, catches from other rivers, and indices from offshore trawl catch data.

Reviewers' comments were positive, but identified the need to present an overview of eulachon life history and biology and present an explicit description of methodology. Specific concerns were raised over the estimation of confidence intervals and the use of non-random samples. One reviewer indicated that a stratified sampling design might be a more appropriate method for analyzing the data. It was suggested that the confidence limits did not incorporate all of the variability. Modifications to future sampling might address the issue.

Conclusions

The Subcommittee accepted the paper with revisions as outlined by the reviewers, with revisions to focus on dealing with uncertainty in biomass estimates. The Subcommittee complimented the authors on the effort and noted the paper provides a valuable basis for future work in developing an effective management strategy for Fraser River eulachon. The Subcommittee accepted the spawning stock biomass estimate outlined in the paper and noted the estimate should be considered conservative. The Subcommittee noted that this estimate of spawning stock biomass can be used as one reference point and will be considered with other independent indicators to be outlined in an upcoming paper.

Recommendations

The Subcommittee recommended that egg and larval studies be continued and endorsed the authors' suggestion that sampling intensity could be reduced.

P2002-09: A review of the biology and fishery of the embiotocids of British Columbia

E.D. Lane, A. McDiarmid, W. Wulff, D.E. Hay **Accepted subject to revision**

Rapporteur: Greg Thomas

Reviewers indicated the paper generally met the objective of providing a phase 0 review of British Columbia embiotocid (surf perch) populations and fisheries. The reviewers indicated however that the information base provided should be augmented by reviews of other species databases, such as groundfish trawl, and commercial harvest log data. The authors noted that few of these fisheries data are available for individual species, but are available as a 'perch' aggregate. It was also suggested, given the potential value of recreational catch data, that the creel survey methodology be documented. It was suggested further that the paper would benefit from a conclusion section that expands upon management implications and recommended assessment approaches.

The Subcommittee discussion centered on the implications of the low productivity of British Columbia surf perch populations and their susceptibility to overharvest. Given their low fecundity and high rates of mortality, populations are at risk of serial depletion by intensive fisheries and would be slow to recover. This problem is exacerbated by the fact that there are eight species of surf perch in British Columbia of which three have extremely small populations with restricted ranges.

The data presented on recreational fisheries indicate surf perch harvests are low and probably not a source of concern. The Subcommittee noted that any removals should be reported as individuals, since estimation as biomass will be small due to individual small size and would not best reflect impacts of removals. There was insufficient information presented regarding the commercial fishery to provide for an assessment of impacts. Anecdotal information suggests that effort and catch in the commercial trawl fishery remains low, however, there is concern that there may be high discard levels in a commercial seine fishery harvesting surf perch for live sale. There was also concern expressed that illegal harvest may be substantial and these unregulated fisheries may be of a conservation concern.

Conclusions

The paper was accepted with revisions. The revision should include in particular a review of directed commercial fishery information and if available, embiotocid bycatch data from groundfish and shrimp trawl fisheries. The Subcommittee concluded that catches in current recreational fisheries do not present a conservation concern to coastwide populations, but there may be some localized depletion (associated with docks and wharves).

Recommendations

1. Given the low fecundity of surf perches and the capacity for localized depletion through fisheries, the Subcommittee recommended that genetic studies be undertaken to examine stock structure of surf perch populations.

2. The Subcommittee recommended that the sensitivity of surf perch populations to overharvest be communicated to the recreational fishing community, perhaps as a note in the recreational guide.

3. It is recommended that monitoring and enforcement of commercial fishery regulations and logbook requirements be enhanced. Logbooks should be modified to specify the three major species authorized for harvest. A seasonal commercial closure should be implemented for the period May 1 to August 31 to protect spawning aggregations.

P2002-10: Review of surf smelt (*Hypomesus pretiosus*) biology and fisheries, with suggested management options for British Columbia

T. Therriault, A.N. McDiarmid, W. Wulff, D.E. Hay **Accepted subject to revisions**

Rapporteur: Jim Kristmanson

The Subcommittee discussed the estimation of spawning stock biomass based on potential spawning area, egg deposition depth, egg density and relative fecundity and while it was considered a useful framework and direction, it should be considered to be exploratory. Similarly, the methods for estimating recreational catch, should be used as a starting point and not as a reliable estimate.

The distribution of surf smelt was noted to be disjunct and associated with estuaries of major rivers. This raised the possibility of different stocks and potential genetic differences between stocks. The Subcommittee felt that a genetic study was warranted to determine stock structure, because there is a potential for local depletion in some areas.

There was considerable discussion about the recreational fishery in Areas 28 and 29. It was noted that this fishery is currently unmonitored, but an intense fishery with growing interest is in operation. The current bag limit in British Columbia is 20 kg, but the Subcommittee felt that it was likely that the average retention was well below this limit. Recreational smelt fisheries in Washington State have a lower bag limit (4kg) and because of differences in access to coastal areas, is likely a more constrained fishery than in British Columbia. The Subcommittee felt that without abundance information or catch and effort data, it is not possible to determine if the current level of exploitation in the recreational fishery is sustainable. Given this lack of information, the Subcommittee expressed concern about the expanding recreational fishery in Areas 28 and 29 and agreed that limitation to its expansion was warranted.

The Subcommittee discussed the commercial smelt fishery in Areas 28 and 29. Logbook compliance is low so catch and effort data are unreliable. The size of this fishery is uncertain but it could be as large as the recreational fishery. It was noted that though there were presently about 25 license holders, only half were active. In addition, during interviews with license holders, it was revealed that very little of the catch was sold, most being kept for personal use. The Subcommittee agreed that given the level of information obtained from the commercial fishery and the concern that it was being conducted as a privileged recreational fishery, that it should not be continued as it is presently conducted. It would be appropriate to conduct this fishery in a Phase 1 approach.

Conclusions

The Subcommittee commended the authors on a job well done and an informative paper. The paper was accepted with revisions. The Subcommittee concluded that surf smelt biology and fishery data in British Columbia are extremely limited. The unmonitored and growing recreational fishery in Areas 28 and 29 could pose conservation concerns. The Subcommittee noted that recreational and commercial fishery data in other areas of British Columbia are even more data limited than Areas 28 and 29 but those fisheries were not likely as intensive. The Subcommittee concluded that the commercial fishery should not be continued as it is presently conducted, given that there is an extremely low level of compliance and that very little of the catch is sold commercially.

Recommendation

1. In Areas 28 and 29, the Subcommittee recommended that managers consider additional measures to limit further expansion of the recreational fishery.

2. The Subcommittee recommended that the recreational fishery be monitored to collect information on catch and effort.

3. The Subcommittee recommended that a Phase 1 approach be implemented with the commercial license holders to collect distribution, biological, abundance and genetic information using an experimental fishery design.

4. The Subcommittee recommended that a genetic study for stock identification be initiated.

P2002-11: A review of northern anchovy (*Engraulis mordax*) biology and fisheries, with suggested management options for British Columbia

T. Therriault, A.N. McDiarmid, W. Wulff, D.E. Hay **Accepted subject to revisions**

Rapporteur: Ron Tanasichuk

The reviewers and the Subcommittee felt that this report was a comprehensive description of what is known about the biology and fisheries of northern anchovy. One reviewer felt that there should be more detailed discussion about the possibility of resident anchovy stocks existing in British Columbia. The Subcommittee agreed and noted that management policies would be considerably different under migrant versus resident scenarios. If anchovy migrate into British Columbia waters, then the management policy could be similar to that in place for Pacific sardine. Several Subcommittee members noted the occurrence of northern anchovy in British Columbia waters during winter months in areas like Barkley Sound and Jervis Inlet. Consequently, the Subcommittee felt that it would be important to determine whether potentially exploitable northern anchovy aggregations are members of a larger

population or genetically distinct. If northern anchovy in British Columbia were genetically distinct, then a much different management strategy would need to be developed.

A reviewer suggested that there should be some consideration of how assessments could monitor the considerable annual population fluctuations and explore using oceanographic variables to provide some prediction of abundance. The authors presented a figure showing time series of British Columbia anchovy catch in comparison with annual measures of sea surface temperature and salinity. The Subcommittee concluded that historic annual landings for British Columbia were not a proxy for abundance and at best indicated presence or absence of anchovy.

There was some discussion regarding commercial interest in anchovy fisheries. There has been interest and some activity in harvesting anchovy as bait.

The Subcommittee requested that Figure 2 in the working paper, which presented spawning biomass and recruitment estimates for the central stock, and ranges between central and Baja California, be replaced with a table which give the time series of catch estimates for the central and southern stocks.

Conclusions

The Subcommittee accepted the working paper with minor revisions. The Subcommittee concluded that it is important to determine if northern anchovy in British Columbia waters are members of a larger population or genetically distinct. The Subcommittee concluded that while there is no immediate interest in establishing a directed northern anchovy fishery, any future commercial fishery for northern anchovy would need to be developed under a Phase 1 experimental fishery approach. This should include monitoring of bycatch of juvenile salmon and herring.

Recommendations

The Subcommittee recommended that any commercial fishery for northern anchovy be developed under the Phase 1 approach with the design of an experimental fishery and the collection of information on abundance, biology, distribution, and stock structure.

P2002-12: Population structure of herring (*Clupea pallasi*) in British Columbia, with comparisons to southeast Alaska and California

T. Beacham, J. Schweigert, C. MacConnachie, K.D. Le, K. Labaree, and K.M. Miller
Accepted subject to revisions

Rapporteur: Peter Midgley

This paper presents a genetic analyses of Pacific herring based on analyses of microsatellite variation at 13 loci. Much of the paper was presented in an earlier PSARC paper (2001), but this paper included additional samples from a number of smaller, peripheral populations. It also included some additional samples from major spawning populations allowing analysis of inter-annual differences in genetic structure, within the same population.

The Subcommittee discussed how many replicate samples would be required to obtain a definitive answer on population structure. The authors suggested that samples over a minimum of two years were required to compare interannual variability to spatial variability but noted that more samples would be better. However, for locations that show evidence of divergence from the regional norm, further sampling would be warranted to confirm genetic differences. The Subcommittee felt that this was warranted for areas such as Winter Harbour which had conflicting results from the two years of sampling and Esquimault / Portage Inlet where there are marked differences in allele frequency from those of the region. It was also noted that inter annual variation would not completely stabilise over time as more samples are collected due to sampling variability.

Further sampling was requested from areas that are of interest, either those that are underrepresented, such as the southern Strait of Georgia (section 173) and area 18, or show some variation from the main putative populations, such as Louscoone Inlet, Winter Harbour, Wilson Inlet, Secret Cove, Skidegate Inlet, Klaskish Inlet, Cumshewa Inlet, Esquimault / Portage Inlet, Naden Harbour and Johnstone Strait.

The Subcommittee discussed the value of obtaining size and age data, since the presence of a strong year class could obscure potential temporal variability in sequential sample taken from a putative population. The authors suggested that this was unlikely. The possibility of collecting these data was also discussed.

The Subcommittee noted that tagging studies indicate that some populations in an area (namely Louscoone Inlet) may move within a spawning season and that time of sampling might confound between year variability. It was pointed out that genetically distinct spawning populations do not overlap spatially in marine fish. From this it was concluded that relatively small differences in the timing of spawning within an area were not critical, and if the sample was from a spawning biomass, it could be assumed to represent the putative population.

The Subcommittee discussed the stock structure of the putative populations targeted by the summer bait fishery. It would be worthwhile to determine where the fishery aggregates originate. This could be addressed by sampling the fishery aggregates and determining their genetic distinctiveness from spawning aggregates in the area.

Conclusions

The paper was accepted with revisions. The Subcommittee concluded that until a putative population can be considered genetically distinct, the current fishing boundaries and stock assessment regions should remain unaltered. The Subcommittee noted that the present analysis was supportive of the present stock assessment areas used for Pacific herring. As a consequence, the present roe fishery would not pose a risk for the loss of genetically distinct populations. There is, however, strong evidence of some small genetically distinct populations that occur mainly outside or at the edge of major assessment areas. The Subcommittee concluded that more years of samples are required to further understand temporal variability and consistency in such samples that show preliminary genetic distinctiveness.

Recommendations

1. The Subcommittee recommended that over the next few years, samples be collected and analysed for the areas listed in the discussion section to address temporal variability. The collection of biological data (size, age) should be included in the sampling.

2. The Subcommittee recommended that samples be collected and analysed from the summer bait fisheries to determine if the fished aggregates originate from the area's putative spawning populations or from other populations. This would also require baseline samples from spawning aggregates in the inlets where the bait fishery operates.

Sardine 2002 fishery update and information from the United States stock assessment

J. Schweigert and G. McFarlane

The total allowable catch for the commercial sardine 2002/03 seine fishery was 5040 tonnes. Twenty eight participants were eligible for seine licenses with individual vessel quotas of 180 tonnes each. To date, five vessels have operated. The fishery is open from August 15, 2002 to June 30, 2003. The 2002/03 seine fishery has been operating from Barkley Sound off the west coast of Vancouver Island up to Smith Inlet in the Central Coast. To date, the 2002/03 fishery has landed only 657 tonnes with most of the catch taken in September and October. The low levels of landings reflect a late start to the fishery, market constraints, and low participation. There has been minimal bycatch with similar estimates to 2001; mostly dogfish.

An additional 1,044 tonnes was allocated for an experimental project for twelve participants to investigate the feasibility of alternative gear types, new product market/types, and to gather more extensive information on fish abundance and biology in areas and times not fished to date. Of the twelve participants, eight were designated to test trap gear with 90 tonnes allocated to each and three were designated to test gillnet gear with 18 tonnes allocated to each. Two trap gear participants have operated and only one gillnet participant has operated. The gillnet operation was quite successful and harvested 5 tonnes in Port Hardy Bay.

Generally, the length composition of sardines was similar throughout the season and across areas. Unfortunately, the 2002 research survey was not as comprehensive as previous years. Mechanical failure of the F.R.V. *W.E. Ricker* meant that only one third of the usual transects were surveyed. There was not enough information for biomass estimates and the estimation of migration of sardines into Canadian waters.

The United States assessment estimates a similar spawning biomass in 2003 as in 2002, of 999,871 tonnes. Using the average sea surface temperature over the last 3 years at the Scripps Institute, the United States has selected a 15% harvest rate. The United States assumes that 87% of the biomass will remain in United States waters. The United States 2003 harvest level has been estimated at 110,000 tonnes. A Canadian industry representative requested that Fisheries and Oceans Canada develop its own model for determining harvest rates.

The migration rate of sardines into Canadian waters has been shown from offshore trawl surveys and historical catches to average 10% of the coastwide population. For 2002, a migration rate of 10% was applied along with the 2002 United States harvest rate (15%) in calculating the Canadian harvest level. With an estimated spawning biomass of 999,871 tonnes, a migration rate of 10% and a harvest level of 15%, the potential 2003 Canadian harvest level would be 14,998 tonnes. This is similar to the harvest level in 2002.

The Canadian fishery data and United States assessment information will be updated and available in a Stock Status Report. The Subcommittee acknowledged that there was no new Canadian information to interpret and that the methodology for determining harvest levels had already been accepted.

Revisions to P2002-01: An evaluation of a recruitment forecasting procedure for Strait of Georgia herring

R. Tanasichuk

This Working Paper was presented at the September 2002 Pelagic PSARC Subcommittee meeting. It was accepted with major revisions, specifically the addition of a retrospective analysis on recruitment forecasting using the estimated Strait of Georgia proportion of age-3 herring from offshore trawl estimates of

proportion of age-2 herring in the previous summer and applying it to the age-structured model estimates of pre-spawning biomass. The retrospective analysis was to examine the accuracy of forecasting the category (Poor, Average, Good) currently used to forecast Strait of Georgia recruitment. These revisions were requested for the November 2002 Subcommittee meeting.

The retrospective analysis revealed that the recruitment forecasting technique predicted the same recruitment category as the observed recruitment indicated in six out of eight years. The current default policy of assuming Average recruitment when information is incomplete or uncertain was accurate in two of eight years. The author noted that the trawl survey-based recruitment forecasts of Strait of Georgia herring are as accurate as those for the west coast Vancouver Island which have been accepted and are used to augment the available information when selecting recruitment categories. The Subcommittee found these revisions to be acceptable. The Subcommittee reiterated its conclusion from September, that these estimates of recruitment should be monitored for the next few years to assess forecasting performance for a sufficient time period.

APPENDIX 1: Working Paper Summaries

P2002-08: Fraser River eulachon biomass assessments and spawning distribution: 1995-2002

D. Hay, P.B. McCarter, R. Joy, M. Thompson, K. West

The eulachon (*Thaleichthys pacificus*) is a small anadromous smelt (Osmeridae) that spawns in the lower reaches of the Fraser River in April and May. In most years, modest catches were taken by First Nations, a small commercial fishery and a recreational fishery. Since the mid-1990s the many participants and observers of these fisheries have expressed concerns about the apparently declining spawning runs. To address some of these concerns we (the authors) adapted marine ichthyoplankton survey methods and assessed eulachon spawning stock biomass (SSB) based on egg and larval production surveys. Eulachons deposit small adhesive, demersal eggs. At ambient temperatures, these eggs hatch into small (<7 mm) pelagic larvae that are rapidly advected downstream, at the same velocity as the river. We developed survey protocols that estimated larval density (n/m^3) at five different locations over a seven-week period. We use the measured river discharge (m^3/s) to estimate the total number of larvae discharged over specific periods of time. We convert this estimate of larval numbers into SSB from our measured estimates of relative fecundity (about 400 egg/g). The SSB estimates are presented with bootstrapped confidence limits for each area, and we discuss the sources of variability and error associated with this assessment method. By comparing the estimated spawning biomass among different areas of the river we can also comment on the general spawning locations each year. Since 1995, we estimate that SSB has varied from a minimum of about 100 tonnes (in 1997) to a maximum of 1600 tonnes (in 1996). The SSB for years 2001 and 2002 are between 800 and

1000 tonnes, although some samples from the 2002 season have yet to be analyzed.

P2002-09: A review of the biology and fishery of the embiotocids of British Columbia

E.D. Lane, A. McDiarmid, W. Wulff, D.E. Hay

There are eight species of surf perches (Embiotocidae) in British Columbia (B.C.) waters and some species have been harvested for over 100 years, primarily by recreational anglers. No reliable quantitative information is available on the recreational or commercial catches in B.C. but from California to B.C. the recreational catch is considerably larger than the commercial catch. In B.C., recreational fishing is almost totally confined to wharves. The present commercial fishery in B.C. is thought to be small, but expanding. Probably this commercial fishery fluctuates with market demand. The most targeted species is probably the pile perch caught for the Asian live fish restaurant trade. There also appears to be a small demand for two species of surfperch (striped and pile) for the fresh fish market. Fecundity of surfperch is a major issue when considering any fishery for any species. All surfperch species have very low fecundity and do not have the potential of large year classes to rebuild a depleted population. The number of young born to females is size dependent by species and age. Embiotocid young have no larval period. They are born completely developed, free swimming and at considerable size. Presently, there are insufficient data on specific distributions of B.C. surfperches. In conjunction with existing surveys we recommend that data be collected on surfperch populations to further our knowledge on their distribution and basic biology. Existing commercial regulations should be changed or enforced. Commercial fisheries should enforce the mandatory harvest logs to allow catch estimation.

P2002-10: Review of surf smelt (*Hypomesus pretiosus*) biology and fisheries, with suggested management options for British Columbia

T. Therriault, A.N. McDiarmid, W. Wulff, D.E. Hay

Surf smelt (*Hypomesus pretiosus*) occur throughout temperate coastal regions of the northeast Pacific. Despite small local fisheries operating for over a century, primarily in Washington State and British Columbia, notably Burrard Inlet, San Juan Inlet and Prince Rupert Harbour, the distribution and abundance of this species has been poorly described. During the early 1900s most smelt were taken in small, commercial fisheries for local consumption. The commercial fishery peaked in 1904 with a coastwide catch of 230mt. Since then, the commercial fishery has largely disappeared and is being replaced by a growing recreational fishery that peaks during spring and summer months at surf smelt spawning beaches. This rapidly expanding recreational fishery has raised concerns that the fishery might not be sustainable, especially if an increased proportion of the recreation catch is intended

for commercial markets. Therefore, we provide a precautionary management strategy for surf smelt in British Columbia including recommendations.

P2002-11: A Review of northern anchovy (*Engraulis mordax*) biology and fisheries, with suggested management options for British Columbia

T. Therriault, A.N. McDiarmid, W. Wulff, D.E. Hay

The British Columbia northern anchovy (*Engraulis mordax*) population is part of the northern stock and is the smallest and least exploited of the three major northern anchovy stocks. British Columbia has supported intermittent commercial fisheries for this species, but data on their biology and distribution is limited. Northern anchovy landings peaked in 1941 (around 6000mt) but have since declined with 0mt landed between 1996 and 2001. Given considerable inter-annual variability in population biomass, participation in northern anchovy commercial fisheries is declining. Central British Columbia marks the most northern extent of the species geographic range. Thus, it is probable that northern anchovy productivity is low and north-south movement high. Furthermore, in addition to considerable inter-annual variability, the current biomass of northern anchovy in British Columbia is sufficiently low that commercial fisheries would not be practical or sustainable. Given existing data deficiencies, we recommend initiating a survey to determine background biomass levels for northern anchovy in British Columbia. Should the northern anchovy biomass in British Columbia reach a level where interest in commercial fisheries again arises, we suggest a precautionary approach to manage this fishery, including monitoring to address herring or juvenile salmon by-catch concerns and the effects of harvesting on a highly variable, under-utilised pelagic species.

P2002-12: Population structure of herring (*Clupea pallasi*) in British Columbia, with comparisons to southeast Alaska and California

T. Beacham, J. Schweigert, C. MacConnachie, K.D. Le, K. Labaree, K.M. Miller

The purpose of this study was to determine population structure of herring (*Clupea pallasi*) in British Columbia. Variation at 13 microsatellite loci (Cpa6, Cpa27, Cha63, Cpa100, Cpa103, Cpa104, Cpa107, Cpa107a, Cha113, Cpa114, Cpa115, Cpa125, Cpa134) was surveyed in approximately 20,000 herring from 78 sampling locations. F_{ST} estimates by locus varied between 0.0006 and 0.0093, with the mean over all loci of 0.0032. Other than for herring spawning in Skidegate Inlet, there was no evidence of substructure for herring along the east coast of the Queen Charlotte Islands. No substructure was observed in west coast Queen Charlotte Islands herring, but herring in Louscoone Inlet at the extreme south west coast of the Queen Charlotte Islands may be distinct from herring in the east coast management unit. No convincing evidence of substructure was observed in either the North Coast or Central Coast stocks. No significant substructure was observed in herring in Johnstone Strait, although there is potential for herring spawning in the mainland inlets in the region to be distinct. In the Strait of Georgia, there was no evidence of

substructure within the stock spawning along the east coast of Vancouver Island between Comox and Nanaimo. Herring spawning in Esquimault Harbour were distinct from the Strait of Georgia stock, and herring spawning in Secret Cove along the mainland coast may be distinct. Strait of Georgia herring were distinct from those spawning at Cherry Point in Puget Sound, Washington. No evidence of substructure was observed in the west coast of Vancouver Island stock. On a regional basis, herring in Johnstone Strait were distinct from those in other regions of British Columbia, but there was, on average, no significant differentiation between east and west coast Vancouver Island populations, or among Queen Charlotte Islands, North Coast, and Central Coast populations. The lack of genetic differentiation among herring stocks in British Columbia is consistent with straying rates among stocks that are sufficient to homogenize allele frequencies over broad areas. Herring spawning in southeast Alaska are distinct from those spawning further south on the Queen Charlotte Islands and in the north coast of British Columbia. Herring spawning in California are distinct from those spawning in southern British Columbia. For locations where genetically distinct populations occur, differences in timing of spawning are the main isolating mechanisms, although geographic isolation of the spawning population may also have some effect in maintaining genetic distinctiveness of the spawning population.

APPENDIX 2: PSARC Pelagic Subcommittee Meeting Agenda November 19-20, 2002

Tuesday, November 19

8:30-9:00	Introductions and Opening Remarks. Chair's report from RMEC.
9:00-11:00	Fraser River eulachon assessment (D. Hay et al.).
11:00-12:00	Review of smelts in BC: biology and fisheries with management recommendations (T. Therriault).
12:00	*Lunch*
1:00-2:00	Therriault continued.
2:00-2.30	*Break*
2:30-3:00	Sardine fishery update (J. Schweigert and G. McFarlane).
3:00-4:00	An evaluation of a recruitment forecasting procedure for Strait of Georgia herring: presentation of retrospective analyses (R. Tanasichuk).

Wednesday, November 20

9:00-11:00	Review of anchovy in BC: biology and fisheries with management recommendations (T. Therriault).
11:00-12:00	Review of surf perches in BC: biology and fisheries with recommendations for fishery action and data collection (D. Lane).
12:00	*Lunch*
1:00-2:00	Lane continued.
2:00-4:00	Update on microsatellite DNA project, results for 2001 (T. Beacham and J. Schweigert).

APPENDIX 3: List of Attendees & Reviewers

Subcommittee Chair: Jackie King
PSARC Chair: Al Cass

DFO Participants	**Tues.**	**Wed.**	
* Subcommittee Members			
Anderson, Don*			
Chalmers, Dennis*	✓	✓	
Daniel, Kristen	✓	✓	
Fort, Chuck*	✓	✓	
Gillespie, Graham		✓	
Hamer, Lorena*	✓		
Hay, Doug*	✓	✓	
Irvine, Jim	✓		
Kristmanson, James*	✓		
McCarter, Bruce*	✓		
McDiarmid, Angela	✓	✓	
McFarlane, Sandy*	✓		
Midgley, Peter*	✓	✓	
Mijacika, Lisa*	✓		
Potyrala, Mark*	✓	✓	
Rusch, Bryan*	✓	✓	
Schweigert, Jake*	✓	✓	
Tanasichuk, Ron*	✓	✓	
Therriault, Tom*	✓	✓	
Thomas, Greg*	✓	✓	
Thompson, Matthew	✓	✓	
Trager, Diana*	✓	✓	
West, Kim	✓		
Workman, Greg	✓		
Wulff, Warren	✓	✓	
External Participants:			**Affiliation**
Lane, Dave	✓	✓	Malaspina College
Pepper, Don	✓		Sardine Fishers Association
Ware, Daniel	✓	✓	Herring Cons. and Res. Soc.

Reviewers for the PSARC papers presented at this meeting are listed below, in alphabetical order. In addition, there were three anonymous reviewers. Their assistance is invaluable in making the PSARC process work.

Campbell, Alan	Shellfish Stock Assessment, DFO
Chalmers, Doug	Southcoast Management, DFO
Gillespie, Graham	Shellfish Stock Assessment, DFO
Hay, Doug	Pelagics Stock Assessment, DFO
Irvine, Jim	Salmon Stock Assessment, DFO
Therriault, Thomas	Pelagics Stock Assessment, DFO
Workman, Greg	Groundfish Stock Assessment, DFO